

WHAT IS CLAIMED IS:

1 A method of making paper or paperboard comprising:

- a) introducing at least one cellulytic enzyme composition and at least one cationic polymer composition to a paper making pulp at about the same time to form a treated pulp; and
- 5 b) forming the treated pulp into paper or paperboard.

2 2. The method of claim 1, further comprising introducing at least one first cationic starch to the treated pulp.

3 3. The method of claim 1, wherein said cellulytic enzyme composition contains

10 10 from about 5 % to about 20 % by weight enzyme.

4 4. The method of claim 1, wherein said cellulytic enzyme composition is added to said pulp in an amount of from about 0.100% to about 0.001% by weight enzyme based on the dry weight of the pulp.

5 5. The method of claim 1, wherein said cellulytic enzyme composition comprises

15 15 at least one polyamide oligomer and at least one cellulytic enzyme.

6 6. The method of claim 1, wherein said pulp comprises a sulphite pulp.

7 7. The method of claim 2, wherein a second cationic starch, which is the same or

20 20 different from the first cationic starch, is introduced to the treated pulp before step b).

8 8. The method of claim 1, wherein said at least one cationic polymer composition

comprises a synthetic cationic polymer.

9 9. The method of claim 1, wherein said at least one cationic polymer composition

comprises a polyacrylamide polymer.

10. The method of claim 1, wherein said at least one cationic polymer composition is a synthetic, water-soluble cationic polymer containing acrylamide units and cationic monomeric units.

11. The method of claim 1, wherein cationic polymer in said cationic polymer composition is added to said pulp in an amount of from about 0.0001% by weight to about 5 1.000% by weight, based on the dried solids weight of said pulp.

12. The method of claim 2, wherein said at least one cationic starch is added to said treated pulp in an amount of from about 5 to about 25 pounds per ton based on the dried solids weight of the pulp.

10 13. The method of claim 1, wherein cationic polymer in said cationic polymer composition has a weight average molecular weight of at least about 10,000 and said cationic polymer composition is pre-combined with the enzyme composition before the polymer and enzyme are added together to the pulp.

14. A paper or paperboard made according to the method of claim 1.

15 15. The method of claim 1, wherein the at least one cellulytic enzyme composition and at least one cationic polymer composition are added within ten minutes of each other.

16. The method of claim 1, wherein said at least one cellulytic enzyme composition and at least one cationic polymer composition are added within 5 minutes of each other.

20 17. The method of claim 1, wherein said at least one cellulytic enzyme composition and at least one cationic polymer composition are added within 1 minute of each other.

18. The method of claim 1, wherein said at least one cellulytic enzyme composition and at least one cationic polymer composition are added simultaneously.

19. The method of claim 1, wherein said at least one cellulytic enzyme composition and at least one cationic polymer composition are added prior to a blend chest in a paper making process.

20. The method of claim 19, wherein said at least one cellulytic enzyme 5 composition and at least one cationic polymer composition are added prior to a first refiner which is located before the blend chest.

21. The method of claim 19, further comprising introducing at least one first cationic starch to the treated pulp prior to the blend chest.

22. The method of claim 19, wherein said at least one cationic polymer 10 composition comprises a synthetic polymer having at least one nitrogen-containing polymer.

23. The method of claim 21, further comprising introducing at least a second cationic starch to the treated pulp and wherein said first and second cationic starches are the same or different.

24. The method of claim 1, wherein said pulp is a virgin sulfite pulp.

15 25. A paper or paperboard made according to the method of claim 23.

26. A paper making ~~apparatus~~ comprising a supply of an enzyme composition, a supply of a cationic polymer composition, a supply of a paper making pulp, a device for feeding an enzyme composition from the supply of enzyme composition and cationic polymer composition from the supply of cationic polymer to the supply of paper making pulp at about 20 the same time to form a supply of treated pulp, and a device for forming the treated pulp into a treated paper or paperboard.

27. The apparatus of claim 26, wherein said device for forming the treated pulp comprises a blend chest in communication with said supply of treated pulp, a fan pump in communication with the blend chest, a screen in communication with said fan pump, and a head box in communication with said screen.

5 28. The apparatus of claim 27, wherein a supply tank is provided for holding a supply of the treated pulp, and the communication between said supply tank and said blend chest includes a refining apparatus for refining the treated pulp before entering the blend chest.

10 30. The apparatus of claim 27, further comprising a supply of cationic starch, an outlet from the supply of said cationic starch in communication with an inlet to said supply of treated pulp and further comprising a white water silo,

wherein said white water silo has an inlet in communication with said blend chest, an inlet in communication with said head box, and an outlet in communication with said fan pump.

15 30. The apparatus of claim 28, further comprising one or more refiners for refining the pulp or treated pulp prior to forming the pulp in said head box.

31. A method of making paper or paperboard comprising:
a) introducing a cationic polymer composition to a pulp to form treated pulp;
b) introducing at least one cellulytic enzyme composition to said treated pulp to form an enzyme-treated pulp;
20 c) adding a nitrogen-containing cationic polymer composition to the enzyme-treated pulp; and
d) forming the pulp into paper or paperboard.

32. The method of claim 31, further comprising introducing a second cationic polymer composition to the enzyme-treated pulp prior to introducing the nitrogen-containing cationic polymer composition to the enzyme-treated pulp.

33. The method of claim 31, wherein said cationic polymer composition comprises a nitrogen-containing polymer or a starch.

34. The method of claim 32, wherein said second cationic polymer composition comprises a nitrogen-containing polymer or a starch.

35. The method of claim 31, wherein said cellulytic enzyme composition contains from about 5% to about 20% enzyme.

36. The method of claim 31, wherein said enzyme in said enzyme composition is added to said pulp in an amount of from about 0.001% to about 0.100% by weight enzyme based on the dried solids weight of the pulp.

37. The method of claim 31, wherein said enzyme composition comprises at least one polyamide oligomer and at least one cellulytic enzyme.

38. The method of claim 31, wherein said pulp comprises a sulfite pulp.

39. The method of claim 31, wherein said cationic polymer in said cationic polymer composition is added to said pulp in an amount of from about 0.0001% by weight to about 1.000% by weight, based on the dried solids weight of said pulp.

40. A paper or paperboard made according to the method of claim 31.

41. The method of claim 31, wherein said cationic polymer composition is introduced at the blend chest in a paper making process and said at least one cellulytic enzyme composition is introduced at the machine chest of the same paper making process and said nitrogen-containing cationic polymer composition is added at about the whitewater silo in the
5 same paper making process.

42. The method of claim 41, wherein said optional cationic polymer is introduced at the stuff box which is located between said machine chest and said whitewater silo.